RESTORATION ADVISORY BOARD MEETING
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP), BETHPAGE
TOWN OF OYSTER BAY, BETHPAGE COMMUNITY CENTER
103 GRUMMAN ROAD WEST, BETHPAGE, NEW YORK
WEDNESDAY, APRIL 20, 2016

The thirty-eighth (38th) meeting of the Restoration Advisory Board (RAB) was held at the Bethpage Community Center in Bethpage, New York. Meeting attendees included representatives from the Navy (Lora Fly, and Melissa Forrest), the Management Edge (Gayle Waldron), New York State Department of Environmental Conservation (NYSDEC) (Robert Schick, Bill Fonda, Jim Harrington), New York State Department of Health (NYSDOH) (Steve Karpinski,), Nassau County Department of Health (NCDOH) (Joseph DeFranco), Town of Oyster Bay (John Ellsworth), Town of Hempstead (John Reinhardt), H&S Environmental (Greg Pearman and Jennifer Good), Bethpage Water District (BWD)(Michael Boufis, and John Sullivan), Massapequa Water District (MWD) (Stan Carey, Thomas Hand and Joseph Tricarico), H2M (Rich Humann-BWD), Tetra Tech (David Brayack), and Resolution Consultants (Farrell Bell, Brian Caldwell, Gordon Hicks, Valerie Thayer, Vincent Varrichio, Eleanor Vivaudou, and Michael Zobel). RAB members in attendance were Robert Horan, Roy Tringali, Jeanne O'Conner, Sandra D'Arcangelo, Ethan Irwin, Edward Olmstead, and David Sobolow. There were 73 residents from Bethpage and neighboring towns in attendance. The meeting sign-in sheet is provided as Appendix A.

OPEN HOUSE SESSION AND ASSEMBLYMAN

Prior to the start of presentations, an open house session was held. There were two groups of informational poster displays and an area for residents to speak with regulators. The public was invited to peruse the information provided and ask questions to the Navy representatives and regulators.

After the open house and presentations, but prior to questions, Assemblyman Joseph Saladino requested time to speak to the public. He thanked the Navy for addressing the hot spots. In Mr. Saladino's opinion, wellhead treatment will not be adequate to clean the plume. He feels that in order to remediate the plume, it will have to be completely hydraulically contained. Mr. Saladino urged all parties to expedite the cleanup of the aquifer. Mr. Saladino stated that:

- The Magothy Aquifer has the highest concentration of contamination of any sole source aquifer.
- The governor and the NYSDEC commissioner are committed to cleaning up the contamination in the aquifer.

WELCOME AND AGENDA REVIEW

The Navy representative, Ms. Lora Fly, welcomed everyone to the RAB meeting and presented the meeting agenda. Ms. Fly also introduced Gayle Waldron (The Management Edge, serving the role of facilitator in support of the RAB) who then went over the Rules of Conduct to ensure that everyone is allowed the opportunity to comment. The Rules of Conduct are provided in Appendix C. Ms. Fly informed the attendees about navigation of the public website for NWIRP Bethpage (http://go.usa.gov/DyXF). Ms. Waldron introduced David Sobolow the RAB co-chair. Mr. Sobolow introduced the seven RAB members present and explained that they are to be the interface between the community, the Navy and the regulators. Ms. Waldron then invited the water districts and the regulators who were present to introduce themselves. A quorum of RAB members were present; and the meeting minutes to date were finalized.

OU 2 OFFSITE GROUNDWATER INVESTIGATION, SITE 4 UPDATE AND CAPTURE ZONE UPDATE

OU2 Offsite Groundwater Investigation:

Mr. Brian Caldwell, Resolution Consultants, presented the offsite groundwater program objectives. Mr. Caldwell reviewed the local groundwater geology and its applicability to the plume and presented the vertical profile borings (VPBs) and wells that have been installed and sampled since 2009. He described work performed since the last RAB meeting, future work to be implemented and recent reports with their respective results. Mr. Caldwell also provided an update for both Site 4 (Former Underground Storage Tanks), and the Bethpage Water District Plant 6 Capture Zone Pilot Study. The presentation is included in Appendix C.

As described in the presentation, the objectives of the offsite groundwater investigation are as follows: to protect the public water supply wells, to delineate the RE108 hotspot, and to evaluate the capture zone of BWD well 6-2 to ascertain its influence on the hotspot while identifying alternate locations in the event a separate treatment system is needed. Protection of the public water supply wells is fulfilled by installation of outpost monitoring wells coupled with groundwater testing. Delineation of the RE108 hotspot is fulfilled by installing vertical profile borings (VPBs), permanent monitoring wells, and monitoring of water levels using water level dataloggers (37). Addressing the influence of BWD Well 6-2 is fulfilled by performing a pilot study that uses pumping data and well and datalogger data to evaluate the effect of BWD Well 6-2 on the hotspot. Of note, the water level data ensures successful monitoring of outpost wells, and supports the Navy and United States Geological Survey (USGS) groundwater modeling efforts which are designed to determine capture zone analysis for wells as needed for groundwater cleanup.

The process of determining VPB and well locations was then described. Locations are determined based on three criteria: areas designated critical for tracking the plume, minimization of

inconvenience to nearby residents, and space requirements for drilling rig operations.

For discussion purposes, the areas of investigation have been divided into three geographic zones and are referred to as areas north of Hempstead Turnpike, north of Southern State Parkway, and south of Southern State Parkway. Work performed since October 2015 includes: mobilization of three drilling rigs, installation of two VPBs and six monitoring wells (located north of Hempstead Turnpike), installation of six monitoring wells and initiate the installation of an additional VPB (north of Southern State Parkway), and south of Southern State Parkway as well as two rounds of quarterly groundwater sampling. The results of the recently installed VPBs and the quarterly groundwater sampling results were also presented. Future work includes: continued mobilization of three drilling rigs, installation of four additional VPBs north of Hempstead Turnpike and installation of 33 wells associated with both the completed and planned VPBs in the three geographic areas.

Site 4:

An update on NWIRP Bethpage Site 4 (Former Underground Storage Tanks, NWIRP Bethpage) was presented, which included a summary of the site history. A bench scale treatability study was sent to NYSDEC.

BWD Plant 6:

An update on the BWD Plant 6 Capture Zone Pilot Study was presented. The purpose of the capture zone analysis test is to identify the effect of BWD Plant 6 wells in relation to the RE108 hotspot. The duration of the test is planned for a 90 day duration. Data from observation wells is collected and analyzed weekly to determine effects of pumping.

RE108 HOTSPOT UPDATE

Mr. David Brayack of Tetra Tech provided a presentation outlining the RE108 hotspot area Investigation. The presentation is included in Appendix C.

The hotspot was confirmed in 2011 by the presence of trichloroethene (TCE) in groundwater at concentrations greater than 1,000 parts per billion (ppb). Mr. Brayack went over the elements of the remedial design and presented several options for the space needed to house the extraction wells and pumping/air stripping equipment. He also discussed excess water disposal options that are currently under evaluation.

Mr. Brayack also provided a preliminary time line for system design and startup.

Discussion questions and answers were as follows:

1. Why put the water in the Massapequa Creek with fish and live healthy turtles? (referring to an RE108 treated water disposal option being evaluated) - Ms. Fly answered that the water to be discharged will have been treated and will no longer be contaminated. Mr. Brayack stated that discharge to Massapequa Creek is an option that is just now being evaluated and will be discussed with the NYSDEC.
2. Is there a concern of salt water intrusion? (referring to extraction of groundwater in the RE108 hotspot) - Mr. Brayack answered that there is no concern. The recovery wells will extract the same amount of water as the BWD Plant 6-2 normally would. Additionally, NYSDEC Bureau of Water Management will require a water withdrawal permit, which will ensure that no effect will be had on the fresh water supply available.
3. Will the RE108 extracted water be treated with other chemicals? No, the preferred remedy is air stripping followed by granular activated carbon (GAC) contact. No additional chemicals will be added to the extracted water.
4. Define the RE108 hotspot; is it more concentrated or dangerous? A hotspot is defined in the ROD as an area of groundwater with a concentration of total Volatile Organic Compounds (VOCs) of 1,000 µg/l or greater. The drinking water standard is 5 µg/l. RE108 was named for a monitoring well located in the center of the hotspot area. It is more concentrated, but poses no threat to drinking water as the Bethpage Water District wells have been equipped with wellhead treatment; and treatment and sampling ensure that the water district is delivering water clean of contaminants.
5. Is BWD satisfied with level of effort provided for them by Northrop Grumman (NG) and the Navy? (referring to a question directed to Mr. Boufis) Mr. Boufis of the BWD answered that the BWD is working with the Navy and is satisfied with the Navy level of effort, but not with NG. The Navy is committed to fund costs for current and future treatment at BWD Plant 6; NG has not committed funds.
6. Radium in groundwater has not been addressed by the Department of Health (DOH). What is being done to remove the source of radium and other radiological contamination from the site? Mr. DeFranco of the Nassau County DOH answered that there is no confirmed source other than naturally occurring radium. The DOH is still checking information to confirm if radiological work was ever done at the site. Mr. Schick of the NYSDEC said that the DEC has performed 2 rounds of sampling to assess the distribution of radium in groundwater. Thirty-two samples from 18 locations at different depths were collected. There was one area in the vicinity of the NG site where there were 8 picocuries per liter. A second round of sampling was performed on April 12 and finished on April 15. The NYSDEC has the samples and is having them analyzed. The

NYSDEC will continue to work with the water districts and the DOH.

7. What are the water districts doing to remove sources of radium? (referring to radium detections in well BWD well 4-1) - Mr. Boufis answered that there has been no further action other than to take the well offline. The plant has been off-line for 3 years, since the radium was detected. The radium was reported in 2012. When detections started to approach BWD drinking water standards, the well was taken offline. According to the DOH, the radium, as detected in the low quantities in this area, is naturally occurring. It was reiterated that the NYSDEC is doing additional testing at points located on the NG property; Mr. Schick stated that one location near the NG property boundary tested by NYSDEC showed a level above those elsewhere in the area, and it is being re-tested. If the results are confirmed, the investigation will be expanded.
8. Mr. Sobolow asked if anyone knows of a nuclear reactor having operated at the NG facility. Ms. D'Arcangelo responded in the affirmative. Mr. Schick stated that the radiological personnel from the NYSDEC have reached out to NG to ask for them to go through records to provide the information showing that NG had no reactor of any sort. NYSDEC is also reaching out to the Nuclear Regulatory Commission to determine if they have any records of nuclear activity at the site.
9. There has recently been note of a significantly contaminated well near Saint Martin's church - what does that mean for the Hotspot GM-38? This is separate from the GM-38 hotspot, which is shallower. Mr. Schick (NYSDEC) stated that the high contamination is located in a spot that is addressed under the NG Operable Unit 3 for the Bethpage Community Park. The area is a suspected hotspot with a concentration of 14,000 ppb and NYSDEC recently approved a pre-design investigation (PDI) for remediation by NG. As part of that, NG will prepare a design for a pump and treat groundwater recovery system, with fieldwork started by the end of 2016.
10. How deep is the shallow OU2 plume? Has the air and water been tested? The shallow OU2 plume is impacted by numerous sources, including historical septic systems. The contamination from the former NWIRP is generally deeper, and is separated from the shallow plumes by a layer of less-impacted groundwater. The deeper OU2 plume is being addressed by the treatment systems on public water supply wells and is deeper than 500 ft. The air has been extensively tested, and is addressed in the reports for Site 1.
11. What kind of water filtration systems should I install at home? Mr. Boufis (BWD) stated that you do not have to install a filtration system. BWD treatments have removed all the contaminants from the water since the late 1980s, and continue to do so.
12. Is the water safe to use? Mr. Boufis answered in the affirmative.
13. Is there a risk to living on top of hot spot plumes? Mr. Karpinski of the NYSDOH answered that there is no additional risk, as the hotspot plume is deeper than 500 feet, and is overlain by 300 feet of clean groundwater.

14. Has the soil vapor been tested? Mr. Karpinski (NYSDOH) stated that yes, soil vapor has been tested, and results are documented in the NWIRP OU1 reports. The area east of NWIRP was determined to be impacted, and the Navy implemented and completed remediation there. The Navy continues to operate a fenceline soil vapor capture and remediation system to ensure protection of the area.
15. How do we transfer water to South shore? (In reference to extracted RE108 groundwater) - Mr. Brayack answered that water can run in a sewer down Hicksville Road to Boundary Avenue, then discharge to Massapequa Creek. This is an option still being evaluated, and will be included in a feasibility study that will be evaluated by NYSDEC.
16. Mr. Horan wanted to know if the volume of water to be discharged into the storm sewer will be greater than, less than or similar to the volume of water generated by GM-38? (referring to extracted and treated groundwater from the RE108 hotspot) - Mr. Brayack stated that currently GM-38 is pumped at 900 gpm, the RE108 treatment is anticipated to pump 800-1,200 gpm. Disposal options, including discharge to the storm sewer, discharge to a storm basin, and discharge to Massapequa Creek will be evaluated in a feasibility study, reviewed by NYSDEC, and presented to the public prior to implementation.

17. Of the available technology, is air stripping the best? (in reference to treatment of RE108 hotspot extracted groundwater) - Mr. Brayack answered that air stripping and GAC are reliable and preferred, and have already been used with success at GM-38. Other technology such as chemical oxidation and, use of UV lamps and hydrogen peroxide are being evaluated to determine what is best for the site.
18. Is it dangerous to clean up chemicals in groundwater if they are then put in the air? (in reference to the RE108 treatment system) -The air is remediated with GAC scrubbers. The NYSDEC has strict requirements to treat air emitted from the GAC scrubbers and air strippers, and will be included in the engineering design for the RE108 hotspot remediation.
19. When the new president is elected will the current monitoring remain in place? Yes.
20. How can someone have soil tested at your home? A resident can certainly contract an independent lab to take samples; they can also contact the DOH for testing.
21. What is being done to evaluate the presence of 1,4 dioxane? 1,4 dioxane is being analyzed for as part of the Navy's regular quarterly groundwater sampling. These results are presented to the NYSDEC and the water districts as they are received and validated from the lab.
22. What is 1,4 dioxane? It is an organic compound that was typically used to stabilize the

chlorinated solvents detected at NWIRP (TCE) in their commercial form. Mr. DeFranco stated that currently the EPA has a drinking water equivalent level of 1.0 mg/L for 1,4 dioxane, and the Nassau County DOH is monitoring any regulatory actions regarding this compound.

23. Can a footnote be placed on the poster map and fact sheets that have numbers and streets? The Navy will provide a key sheet with wells/VPBs and street addresses at the next RAB meeting.
24. Are there other contaminants being measured besides trichloroethene? A suite of individual organic compounds (approximately 40-50) are analyzed as part of the groundwater monitoring. These are consistent with those being monitored by the water districts.
25. Who at the water districts is in charge of monitoring water to customer? The Nassau County Board of Commissioners is ultimately in charge of the monitoring, and issue the permits for water distribution - the individual water districts are responsible for sampling and compliance per their permit.
26. Have Levittown water wells been affected yet? Ms. Fly answered that Levittown has three wells impacted, and all three have been placed offline. Wellhead treatment systems have been installed on these wells.

CLOSING REMARKS

Mr. Sobolow thanked everybody for coming to the meeting and the meeting was adjourned.

APPENDIX A

20 APRIL 2016 RAB MEETING SIGN-IN SHEET

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
[illegible] Toni Paul			
Robert Horah			
Jeanne O'Connor			
Phil Sachs			
John Reinhardt			
Eileen Glueckert			
Robert Hart			
Paul Pope			
Jeanne [illegible]			
Dave Denenberg			
Deanna Ver[illegible]			
Ethan Irwin			
Carmine + Esther DeStefano			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
KEVIN LUMPE			
Charles Rick			
Michael Nofi			
Joanne Perico			
Hon. Joseph Sal			
FRANK RAIMONDI			
Victor Connolly			
Eleanor Vivadou			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
SCHNEIDER O.			
Joseph DeFranco			
Doris Rosenfeld			
STEVE ROTTACH			
Christine Scarano			
Christine Miller			
John Ellsworth			
Lori Kelly			
Steve Varquish			
Joe & Pat MONGANO			
Jill Skura			
Stephen Foley			
Barbara Thomson			
Lucille Romano			
William Romano			
Anna DeRisecchia			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Jaye MARIÑACCIO			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
DAVID SOBOLOW			
Jessica Kalva			
Theresa Buck			
Peggy Massone			
Adrienne Esposito			
~~Manfred~~ Manfred Bohrs			
Chris Wenckel			
Ronnie Shulman			
Michael Shulman			
Valerie Thayer			
JOHN MCCARTHY			
Stephen Versace			
Kathy Versace			
Robert Fox			
Noah Fox			
Greg Lemmon			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Mike Zobel			
Lauren Fine			
JOHN SULLIVAN			
John Cathy Bernard			
Stan Carey			
Bill Sanchez			
Irene Shapiro			
Rich Humann			
Carol Clemens			
Roy Tungol			
Steven Ma[illegible]			
Steve Fix			
MARTIN HACKER			
Darren Bell			
Dianne + Mike Muller			
Rose Walker			
Laura Schaefer			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
PAUL F. DANNA			
ELIZABETH DANNA			
LOIS DANNA			
RONALD SPOSATO			
BARBARA SPOSATO			
Bill Fonda			
Bill Seevers			
David Bragock			
Jen Good			
Emily Dody			
EVELYN EPPNER			
STEPHEN EPPNER			
Keri Masterson			
Amanda Jacovino			
JANET MAASS			
WILLIAM SQUIRES			

38th RAB Meeting for NWIRP Bethpage
April 20, 2016
Sign-in List

Name (Print)	Phone number and/or email if interested in being on mailing list	Affiliation	How did you hear about the meeting?
Gordon Hicks			
Mike Boufis			
LINDA ILAN			
Ahren Tatro			
Tom Hand			
Susan Spinato			
ANTHONY TAORMINA			
Pat Lucchi			
SANDRA D'ARCANGELO			
JOSEPH TRICARICO			
Steve MARCOLNICK			
ED OLMSTED			
Vin Varricchio			
Dorothy/James Wisniewski			
J. Giovannoni			
PAT MARINO			

APPENDIX B

RAB MEETING AGENDA AND DEFINITIONS

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

Agenda for Restoration Advisory Board

Naval Weapons Industrial Reserve Plant Bethpage

Date: April 20, 2016

Time: 6:30 PM

Location: Bethpage Community Center-103 Grumman Road West, Bethpage NY

Time: 6:30 PM to 7:00 PM

- Open house - general questions from the public

Time 7:00 PM to 8:00 PM

- Ground Rules – *The Management Edge*
- Introduction of RAB members and Regulators - *Navy*
- Distribution of minutes – *Navy*
- OU-2 Offsite Groundwater Investigation/Site 4 update– *Resolution*
- RE108 Hot Spot update – *Tetra Tech*

Time 8:00 PM to 8:30 PM

- Questions – *RAB Members*
- Closing remarks – *Navy*

Copies of information can be found at the document repository located at the Bethpage Public Library, 47 Powell Avenue, Bethpage NY 11714 (516 931 9307) or online at http://go.usa.gov/DyXF.

RESOLUTION CONSULTANTS

RAB Members
David Sobolow – Community Co-Chair
Charles Bevilacqua
Tim Cook
Sandra D'Arcangelo
Robert Horan
Ethan Irwin
Jeanne O'Conner
Eugenia Mazzara
Rosemary Styne
Roy Tringali
Rose Walker

NYSDEC
Jim Harrington
Steve Scharf
Henry Wilkie

NYSDOH
Steve Karpinski

NCDOH
Joe DeFranco

Definitions and Clarification of Terms, Acronyms and Abbreviations

For the Bethpage Restoration Advisory Board (RAB)

- **Basic:**
  - VOC--Volatile Organic Compounds:
    - Chlorinated solvents (typically used as degreasers in manufacturing)
  - Effluent
    - Is an outflow of water from a treatment source
  - Free Product
    - Substance (usually oil or gasoline) that exists in its own state-it is not dissolved in water.
  - Soil Vapors
    - Gases contained in the pore spaces of soil
  - Capture Zone
    - Area of water whose flow direction is influenced by pumping
  - Ground Water
    - Water flows through open pore spaces of soil
  - Down gradient
    - The direction of groundwater flow
  - Plume
    - An area that impacts from chemicals are detected in
  - Raritan Clay Layer
    - A geologic horizon - Clay that is approximately 800-100 feet below ground surface – accepted to be the bottom of the Magothy aquifer
  - Aquifer
    - an underground layer of water-bearing permeable rock or unconsolidated materials
  - Trichloroethylene-
    - Volatile organic compound of concern (used as a degreaser in manufacturing)
  - OU- Operable Unit
  - BGS - Below Ground Surface
  - PCB- Polychlorinated Biphenols (used as transformer cooling fluid)
  - NG- Northrop Grumman
  - NWIRP-Naval Weapons Industrial Reserve Plant
  - No. 6 Fuel Oil- tar
  - Hot spot
    - Area where trichloroethylene is at a concentration greater than 1000 parts per billion
  - BWD Plants- Bethpage Water District Plants

- **Data Gathering:**
  - Gauging- measurement of ground water levels from top of ground surface
  - In-situ – in place
  - Delineate- define boundaries
  - VPB- Vertical Profile Boring
  - Monitoring Well- (typically 2-6 inches in diameter) a well used to provide a "snapshot" of water quality when sampled

- **Treatment Technologies:**
  - Biosparging
    - Removal of chemicals by breaking them down with bacteria
  - Steam Injection/Free Product Recovery
    - Heating of oil that has a tar like consistency with steam to make it flowable (syrup like consistency) so that it may be removed
  - Air Stripping
    - Removal of dissolved volatile organic compounds from water by transferring it into air
  - Land Use Controls
    - Action that restricts what land can be used for
  - Vapor Phase treatment-
    - Removal of a chemical from gas; used to remove trichloroethylene from air vapor
  - Biodegradation
    - Reduce a chemical by changing conditions so that bacteria can break down the chemical
  - On-site Containment Treatment System (ONCT)
    - Series of wells that remove and treat groundwater at the southern edge of the former Northrop Grumman property
  - SVECS—Soil Vapor Extraction Containment System
    - Vacuum for volatile chemicals trapped in the air between soil particles; used to remove trichloroethylene
  - Equalization Tank
    - Tank for mixing
  - Liquid Phase Granular Activated Carbon Polishing
    - Removal of remnants of a volatile chemical by passing liquid through carbon; used to remove trichloroethylene

- Recharge basin
  - Sandy basin that receives storm water and allows water to filter down into the ground
- Recovery Well
  - (Typically larger diameter 12 to 36 inches) a well used to recover oil or water containing chemicals

- **Regulatory:**
  - Proposed Plan- Plan of action that is sent to the state for approval prior to the Final Record of Decision
  - Feasibility Study- collection of data used to determine if a remedy will work
  - ROD –Record of Decision
  - Compliance sampling- collection of samples to demonstrate that chemicals are below regulatory levels
  - CERCLA- **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)** – the legal mechanism for cleaning up inactive hazardous waste sites at DOD (Depart of Defense) facilities, this is the defining regulation for the Navy's Environmental Restoration (ER) Program at NWIRP Bethpage under NYSDEC authority.
  - RCRA- **Resource Conservation and Recovery Act (RCRA) Corrective Action** – a statutorily required cleanup program, similar to CERCLA, that addresses active solid waste management units and contaminated media as a condition of RCRA permits - NWIRP Bethpage has a RCRA Permit with NYSDEC
  - NYSDEC- **New York State Department of Environmental Conservation (NYSDEC)** provides regulatory review and approval of Navy actions at NWIRP Bethpage
  - NYSDOH- **New York State Department of Health (NYSDOH)** assists NYSDEC.
  - USEPA- **United States Environmental Protection Agency (USEPA)** Provides federal review of the Navy actions.

APPENDIX C

PRESENTATIONS

GROUND RULES
APRIL 2016 RESTORATION ADVISORY BOARD (RAB)

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE LONG ISLAND, NEW YORK

4/20/2016

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE RAB GROUND RULES

- **Respect others:**
  - **One Speaker at a time**
  - **No interruptions**
  - **No side conversations**
  - **Listen and stay open to all points of view**
- **Ask questions or make statements after all the presentations are given: (approximately 8:00)**
  - **During the presentations, write any questions on the cards on your table and pass them forward, or raise them and they will be picked up and taken to the RAB Community Co-Chair.**
  - **They will be answered after presentations are completed.**
- **Stay focused on the topics; avoid digressions.**
- **Turn cell phones and /or pagers off, or on vibrate, and respond outside or during breaks, except for emergencies.**

The Management Edge

OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION, SITE 4 UPDATE AND CAPTURE ZONE UPDATE

APRIL 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE LONG ISLAND, NEW YORK

4/20/2016

PRESENTATION LAYOUT

Operable Unit 2

1. Program Objectives
2. Local Groundwater Geology and Applicability to Bethpage Plume
3. 2009 – 2016 Vertical Profile Borings and Wells
4. Recent Work (Performed since last Restoration Advisory Board)
5. Future Work
6. Assessing Results and Recent Reports and Findings

Site 4

1. Update

Capture Zone Analysis Test

1. Update

OBJECTIVES OF OFFSITE GROUNDWATER INVESTIGATION

1. Protection of public water supply wells –
   - All currently planned outpost wells are in place and being monitored quarterly
2. Assessment of RE108 Hotspot –
   - Installation of Monitoring Wells and Vertical Profile Borings to Delineate the Hotspot
3. Capture Zone Analysis Test –
   - Pilot Study in cooperation with Bethpage Water District (BWD) to evaluate the capture zone of one of their wells
   - Area to the southwest of BWD Plant 6 for a separate treatment system

OFFSITE GROUNDWATER INVESTIGATION

Purpose: Delineate groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage

Program Components:

- Vertical Profile Borings (VPB) - used to quickly screen areas for the presence, depth, and concentration of contamination; drilling can take 4-8 weeks to complete
- Permanent Monitoring Wells - to confirm presence/absence of contamination and develop trends; drilling can take 2-6 weeks to complete
- Data logging of water levels - to support modeling and capture zone analysis for wells

VERTICAL PROFILE BORINGS (VPB)

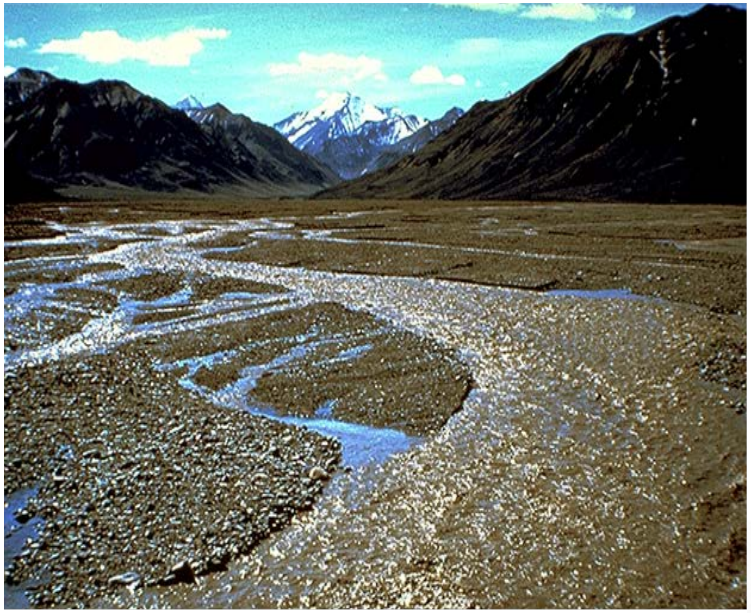
- 12-inch diameter hole drilled into the ground;
- Final boring is 860 to 1,000 feet deep (extending to the Raritan Clay Layer);
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater;
- 44 groundwater samples are collected per boring and analyzed for Volatile Organic Compounds;
- 4 to 8 weeks to complete a boring/well.

VPB AND WELL INSTALLATION PROCESS

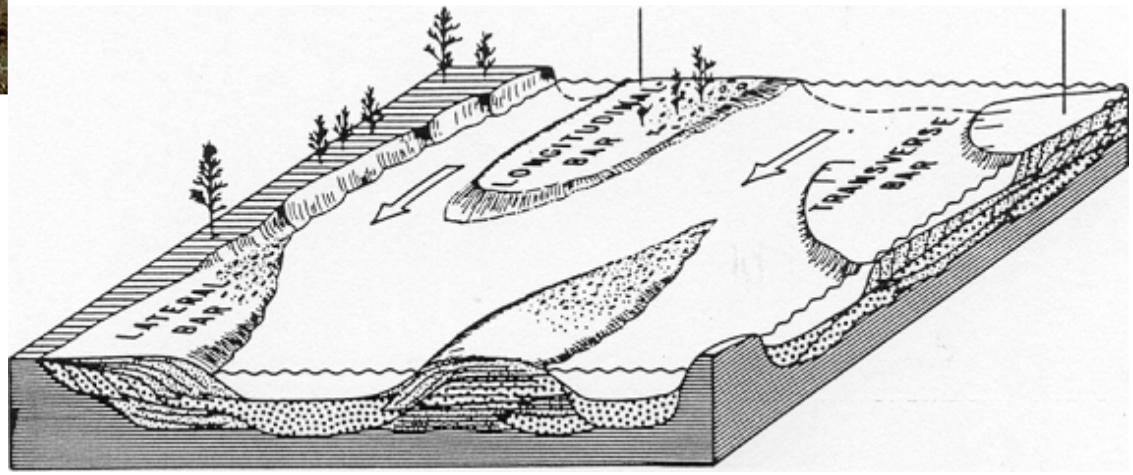
Process:

- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
  - Health and Safety Concerns
  - Ingress and egress
  - Noise
- Advanced notification to nearest residence

LOCAL GROUNDWATER GEOLOGY



MAGOTHY AQUIFER

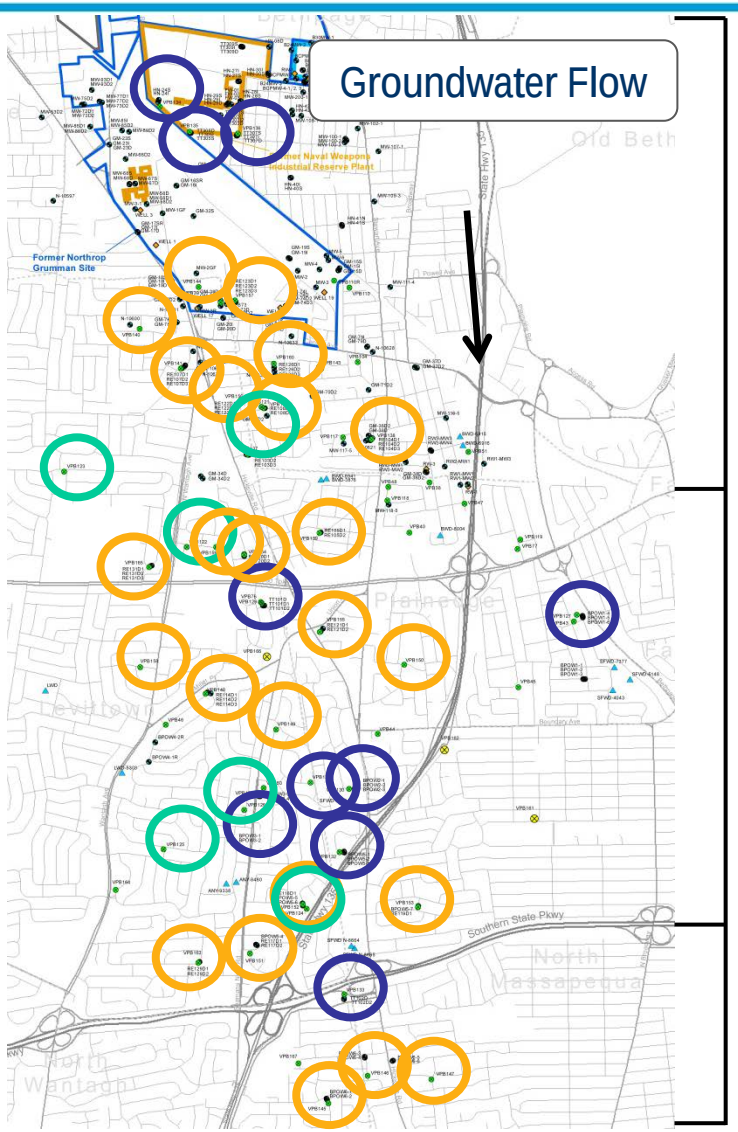


2009 – 2016
VERTICAL PROFILE BORINGS AND WELLS

2009
Completed
(green)

2010 to 2012
Completed
(blue)

2012 to 2016
Completed
(orange)



North of Hempstead
Turnpike Area

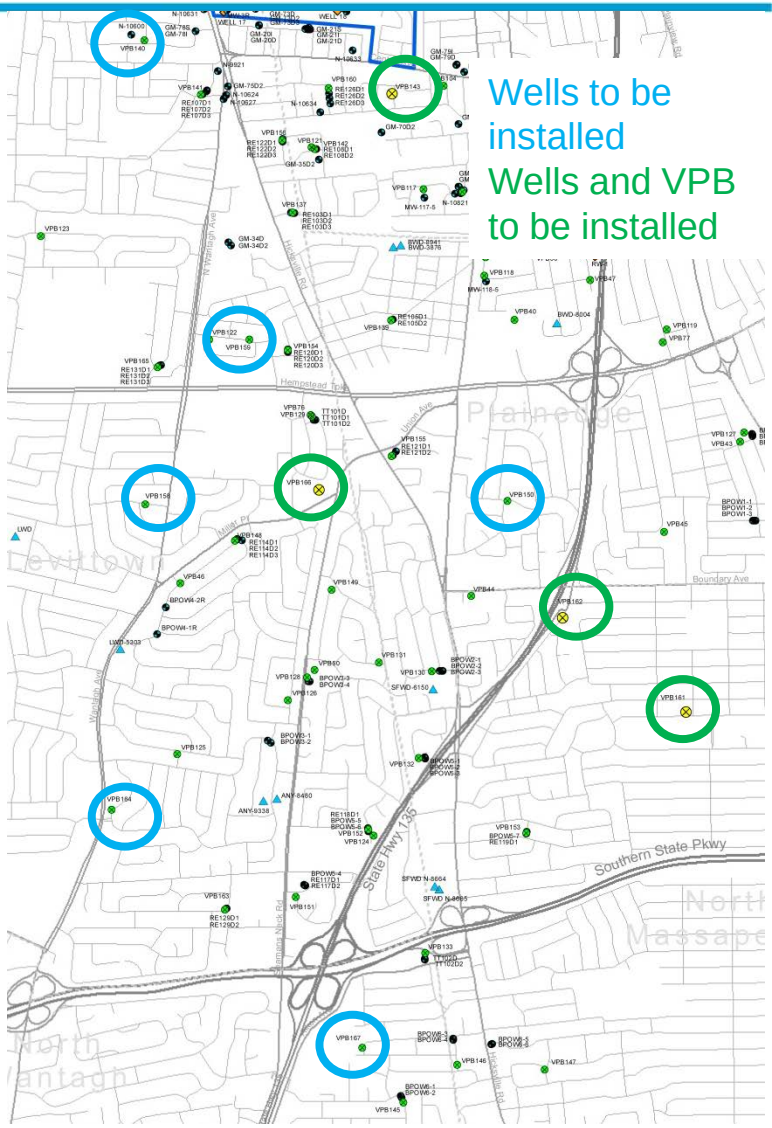
North of Southern State
Parkway Area

South of Southern State
Parkway Area

FUTURE WORK
VERTICAL PROFILE BORINGS AND MONITORING WELLS

Planned work through November 2017:

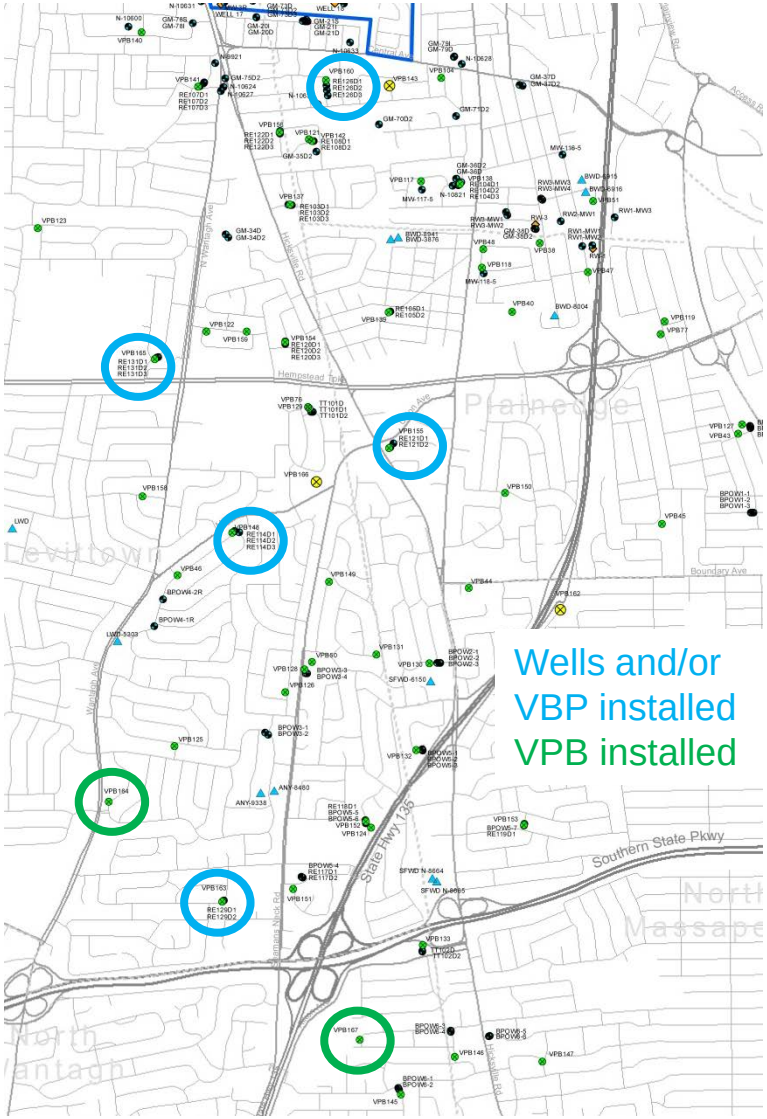
- Operation of 3 drilling rigs
- Installation of Vertical Profile Borings
  - 1 north of Hempstead Turnpike Area, 3 additional VPBs are planned but the locations are not finalized
  - 3 north of Southern State Parkway Area
- Installation of Monitoring Wells
  - 9 north of Hempstead Turnpike Area, 9 additional monitoring wells are planned but the locations are not finalized
  - 18 north of Southern State Parkway Area
  - 3 south of Southern State Parkway Area
- Continue quarterly groundwater sampling
- Installation of Recovery Wells to address RE108 hotspot



RECENT WORK
VERTICAL PROFILE BORINGS AND MONITORING WELLS

From October 2015 to present

- Operation of 3 drilling rigs
- North of Hempstead Turnpike
  - Installation of 2 VPBs 160 and 165 and 6 monitoring wells associated with VPBs 160 and 165
- North of Southern State Parkway Area
  - Installation of 6 Monitoring Wells associated with VPBs 148,155, and 163
  - Began installation of VPB 164
- South of Southern State Parkway Area
  - Began installation of VBP 167
- Completion of 2 rounds of quarterly groundwater sampling



ASSESSING GROUNDWATER RESULTS

Laboratory analysis is performed for multiple volatile organic compounds.

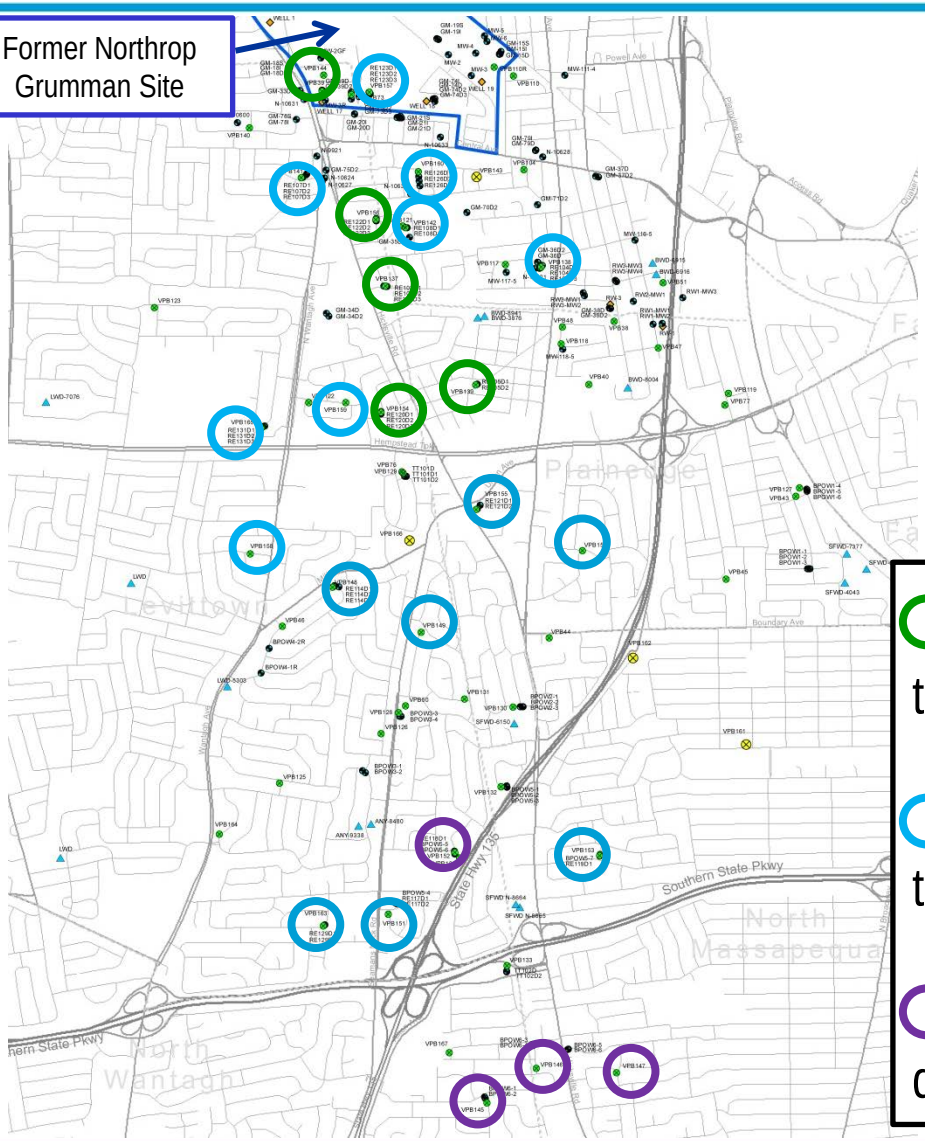
The primary contaminant being used to track the plume is trichloroethene because it has the highest concentrations.

- Acceptable Maximum Contaminant Limit (MCL) is a limit established by Federal and State regulations
- The MCL for trichloroethene is 5 parts per billion

Hotspot Identification:

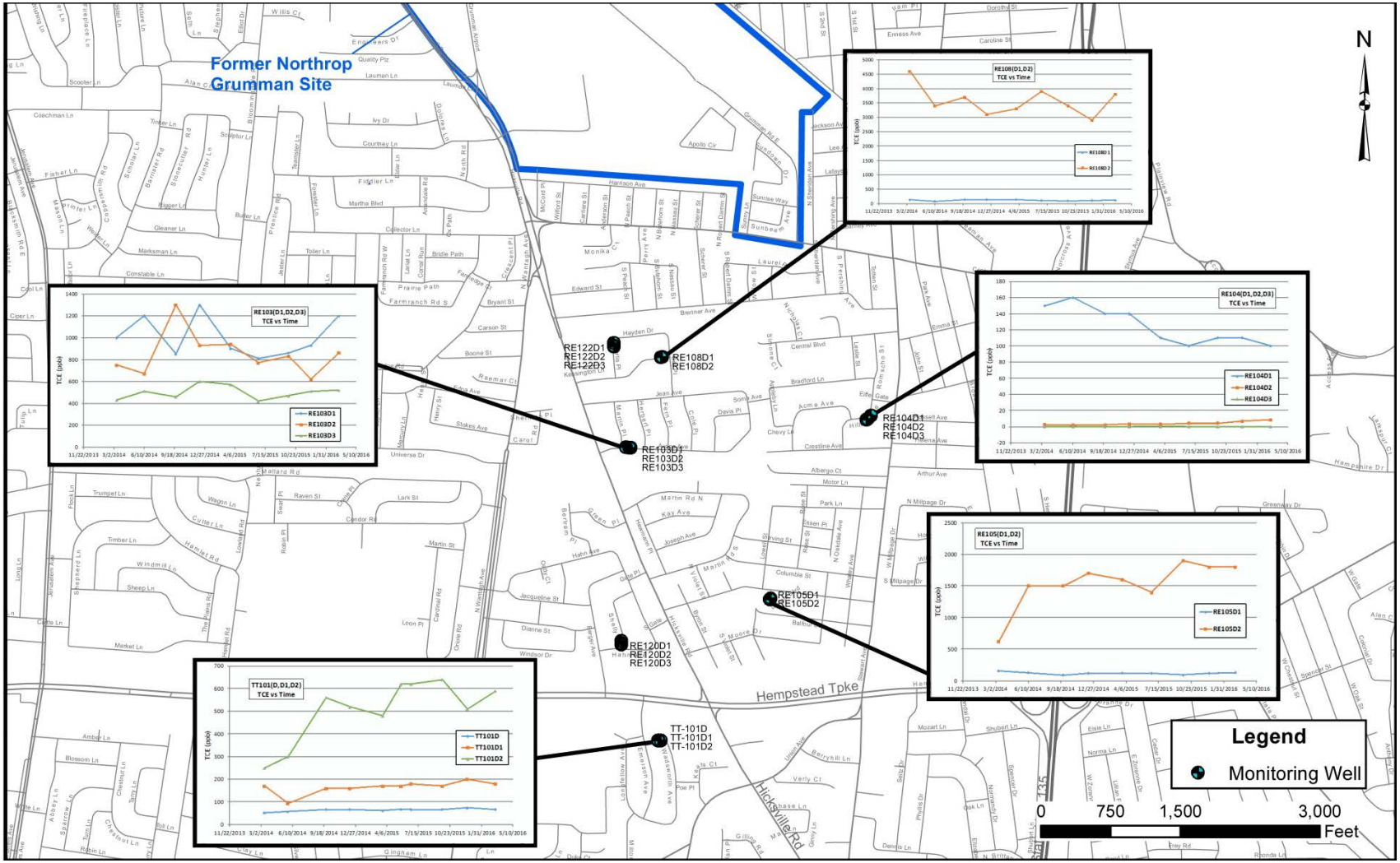
- Area with >1,000 parts per billion of total volatile organic compounds
- Defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision

RECENT VPB RESULTS

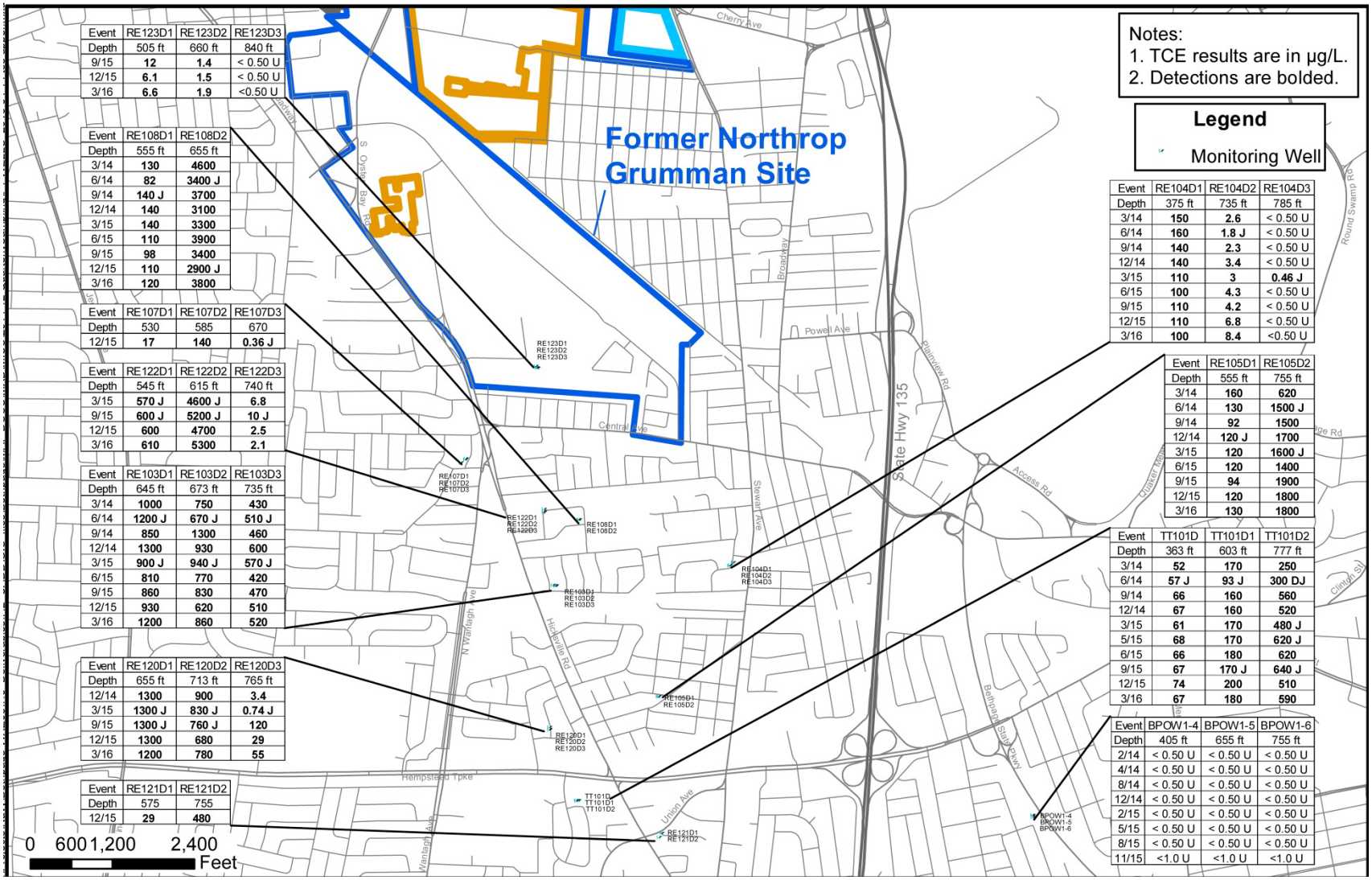


- >1,000 parts per billion trichloroethene
- <1,000 parts per billion trichloroethene
- Trichloroethene not detected

RECENT TRENDS FROM QUARTERLY SAMPLING



RECENT QUARTERLY GROUNDWATER SAMPLING TRICHLOROETHENE RESULTS NORTHERN WELLS



Event	RE123D1	RE123D2	RE123D3
Depth	505 ft	660 ft	840 ft
9/15	**12**	**1.4**	< 0.50 U
12/15	**6.1**	**1.5**	< 0.50 U
3/16	**6.6**	**1.9**	<0.50 U

Event	RE108D1	RE108D2
Depth	555 ft	655 ft
3/14	**130**	**4600**
6/14	**82**	**3400 J**
9/14	**140 J**	**3700**
12/14	**140**	**3100**
3/15	**140**	**3300**
6/15	**110**	**3900**
9/15	**98**	**3400**
12/15	**110**	**2900 J**
3/16	**120**	**3800**

Event	RE107D1	RE107D2	RE107D3
Depth	530	585	670
12/15	**17**	**140**	**0.36 J**

Event	RE122D1	RE122D2	RE122D3
Depth	545 ft	615 ft	740 ft
3/15	**570 J**	**4600 J**	**6.8**
9/15	**600 J**	**5200 J**	**10 J**
12/15	**600**	**4700**	**2.5**
3/16	**610**	**5300**	**2.1**

Event	RE103D1	RE103D2	RE103D3
Depth	645 ft	673 ft	735 ft
3/14	**1000**	**750**	**430**
6/14	**1200 J**	**670 J**	**510 J**
9/14	**850**	**1300**	**460**
12/14	**1300**	**930**	**600**
3/15	**900 J**	**940 J**	**570 J**
6/15	**810**	**770**	**420**
9/15	**860**	**830**	**470**
12/15	**930**	**620**	**510**
3/16	**1200**	**860**	**520**

Event	RE120D1	RE120D2	RE120D3
Depth	655 ft	713 ft	765 ft
12/14	**1300**	**900**	**3.4**
3/15	**1300 J**	**830 J**	**0.74 J**
9/15	**1300 J**	**760 J**	**120**
12/15	**1300**	**680**	**29**
3/16	**1200**	**780**	**55**

Event	RE121D1	RE121D2
Depth	575	755
12/15	**29**	**480**

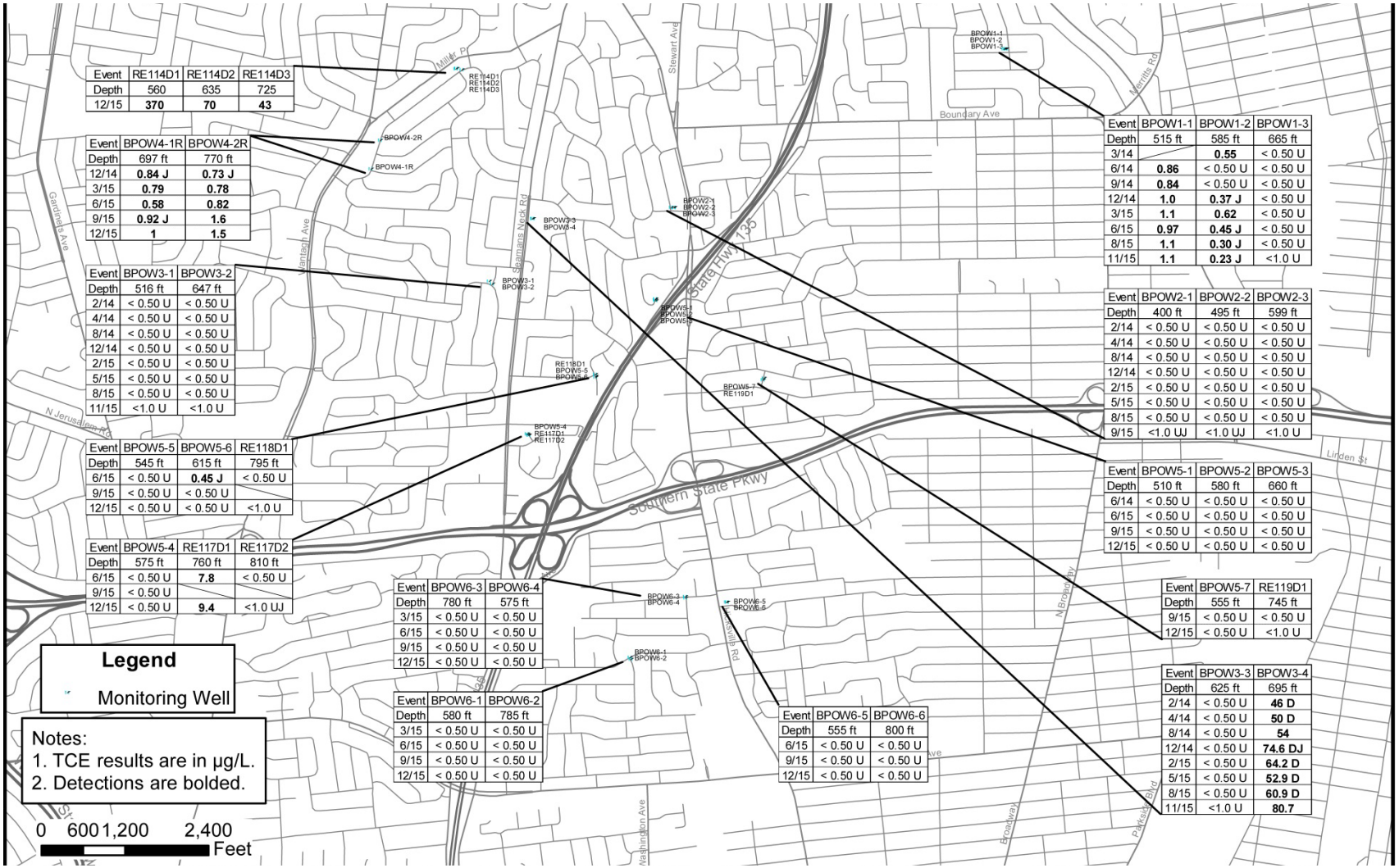
Event	RE104D1	RE104D2	RE104D3
Depth	375 ft	735 ft	785 ft
3/14	**150**	**2.6**	< 0.50 U
6/14	**160**	**1.8 J**	< 0.50 U
9/14	**140**	**2.3**	< 0.50 U
12/14	**140**	**3.4**	< 0.50 U
3/15	**110**	**3**	**0.46 J**
6/15	**100**	**4.3**	< 0.50 U
9/15	**110**	**4.2**	< 0.50 U
12/15	**110**	**6.8**	< 0.50 U
3/16	**100**	**8.4**	<0.50 U

Event	RE105D1	RE105D2
Depth	555 ft	755 ft
3/14	**160**	**620**
6/14	**130**	**1500 J**
9/14	**92**	**1500**
12/14	**120 J**	**1700**
3/15	**120**	**1600 J**
6/15	**120**	**1400**
9/15	**94**	**1900**
12/15	**120**	**1800**
3/16	**130**	**1800**

Event	TT101D	TT101D1	TT101D2
Depth	363 ft	603 ft	777 ft
3/14	**52**	**170**	**250**
6/14	**57 J**	**93 J**	**300 DJ**
9/14	**66**	**160**	**560**
12/14	**67**	**160**	**520**
3/15	**61**	**170**	**480 J**
5/15	**68**	**170**	**620 J**
6/15	**66**	**180**	**620**
9/15	**67**	**170 J**	**640 J**
12/15	**74**	**200**	**510**
3/16	**67**	**180**	**590**

Event	BPOW1-4	BPOW1-5	BPOW1-6
Depth	405 ft	655 ft	755 ft
2/14	< 0.50 U	< 0.50 U	< 0.50 U
4/14	< 0.50 U	< 0.50 U	< 0.50 U
8/14	< 0.50 U	< 0.50 U	< 0.50 U
12/14	< 0.50 U	< 0.50 U	< 0.50 U
2/15	< 0.50 U	< 0.50 U	< 0.50 U
5/15	< 0.50 U	< 0.50 U	< 0.50 U
8/15	< 0.50 U	< 0.50 U	< 0.50 U
11/15	<1.0 U	<1.0 U	<1.0 U

RECENT QUARTERLY GROUNDWATER SAMPLING TRICHLOROETHENE RESULTS SOUTHERN WELLS*



*Wells sampled by Arcadis

GROUNDWATER SAMPLING RECENT RESULTS

- Conclusions:

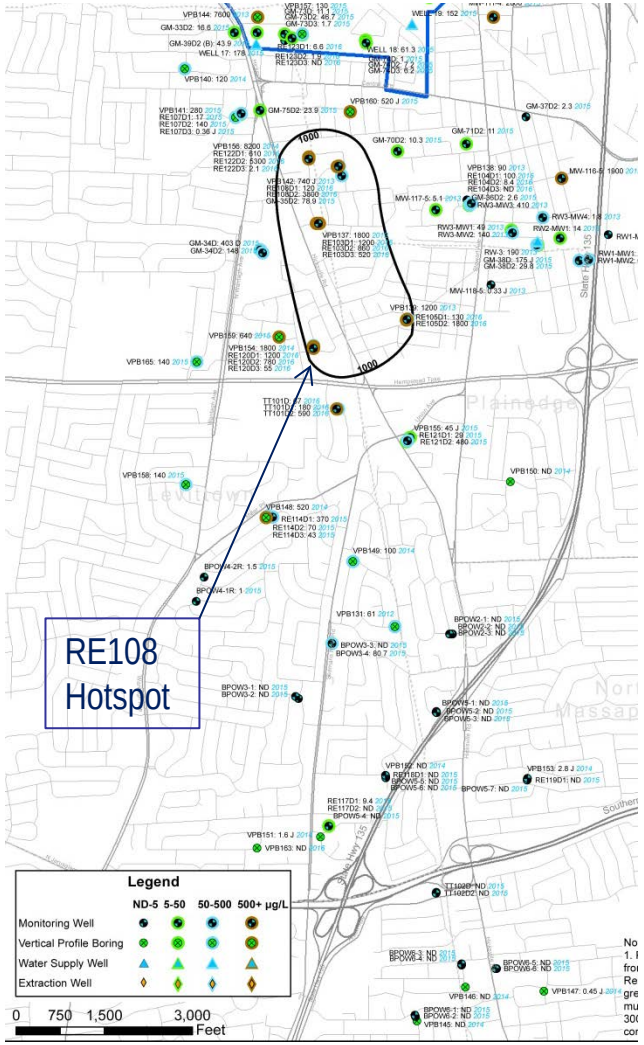
Objective 1 –Recently installed Outpost wells sampled quarterly

Objective 2 -Assessment of hotspots

- RE108 has been identified by latest phase of Navy drilling program;
- Trichloroethylene found above 1,000 parts per billion in the North of Hempstead Turnpike Area at depths greater than 600 feet;
- Additional drilling is planned to the south and west;
- Siting of 2 recovery wells;
- GM-38 Hotspot previously identified to the east has been undergoing treatment since 2009.

Objective 3 – Address Hot Spot

- Treatment options are being evaluated to mitigate potential impacts to public water supply wells; Pilot study has been started in cooperation with BWD and possible recovery well locations are being explored;
- Groundwater monitoring will continue so concentration trends, if any, over time can be assessed.



SITE 4 UPDATE

- Presence of limited petroleum contamination on Navy-owned property;
- Purpose of current work is to evaluate technologies specified in the Record of Decision (October 2015);
- Work plan for the bench scale treatability study was finalized in June 2015;
- A bench scale treatability study was performed, and the report was submitted to the New York State Department of Environmental Conservation (NYSDEC) in February 2016;
- The findings of the bench scale treatability study are currently under review by NYSDEC.

CAPTURE ZONE ANALYSIS TEST

- Purpose of work is to identify capture zone of the BWD Plant 6 well in relation to the RE108 hotspot;
- The test began March 21, 2016;
- Duration of the test is 90 days;
- Data is collected continually on a weekly basis;
- Data analysis performed to ascertain the affect of the Plant 6 well on the plume.

RE108 HOTSPOT UPDATE

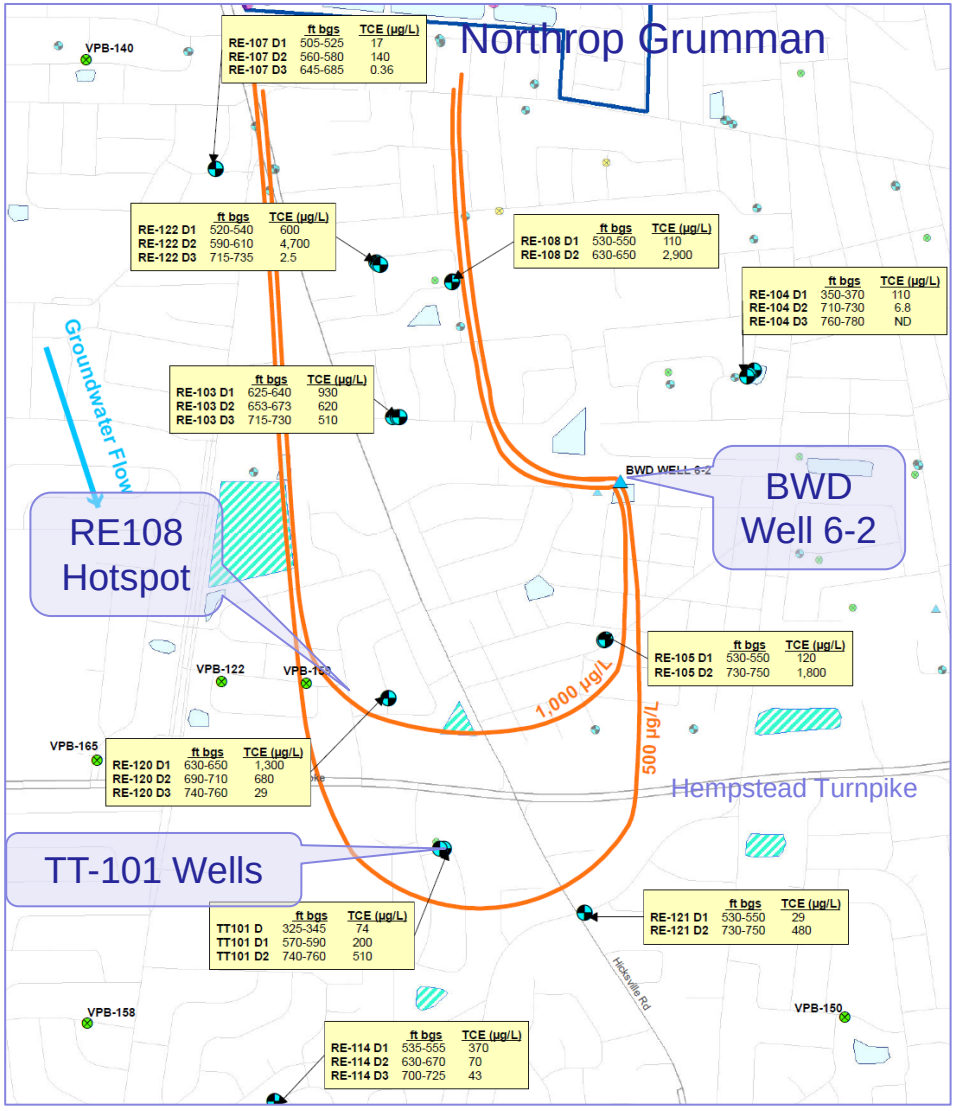
APRIL 2016 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

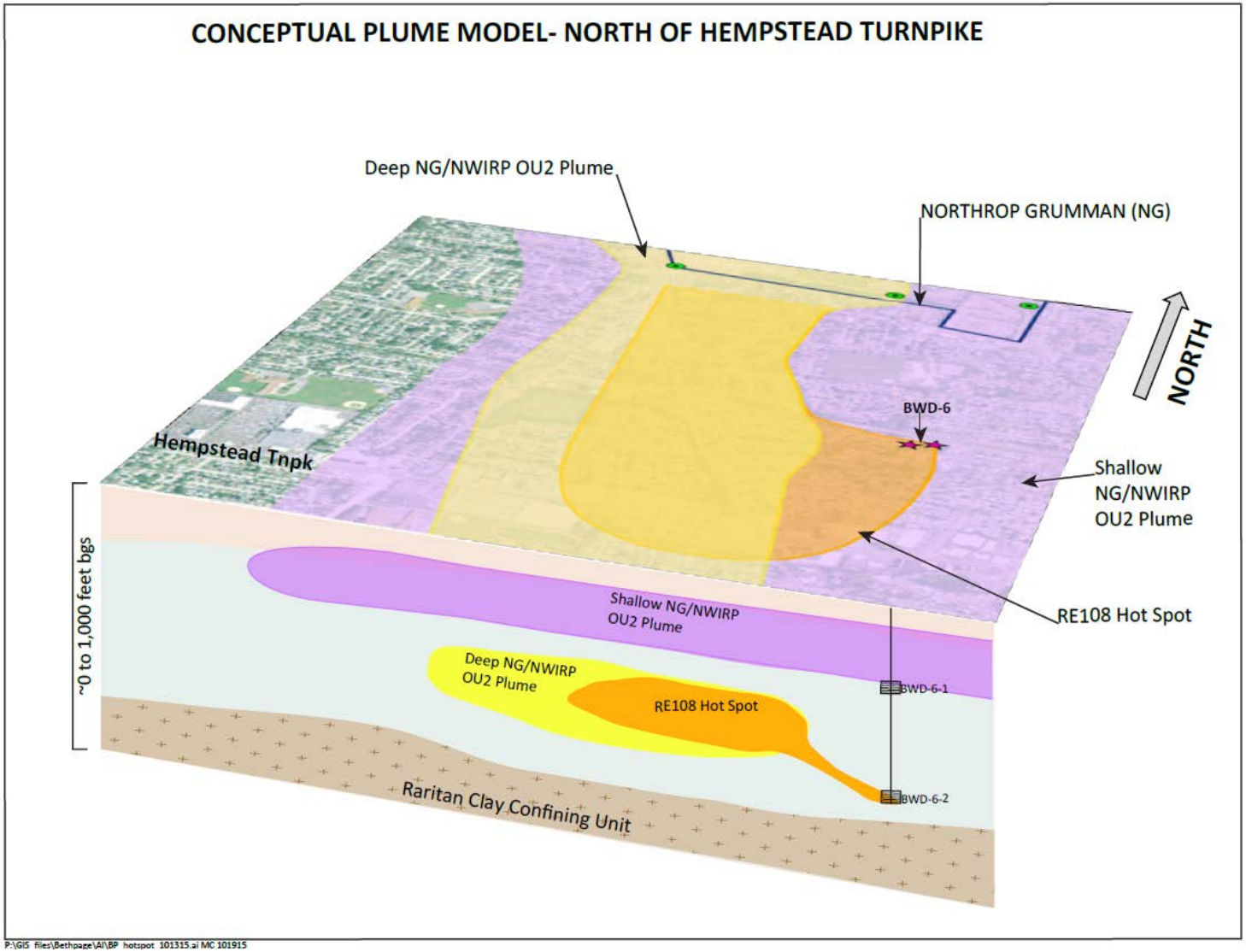
04/20/2016

RE108 Hotspot Area Investigation

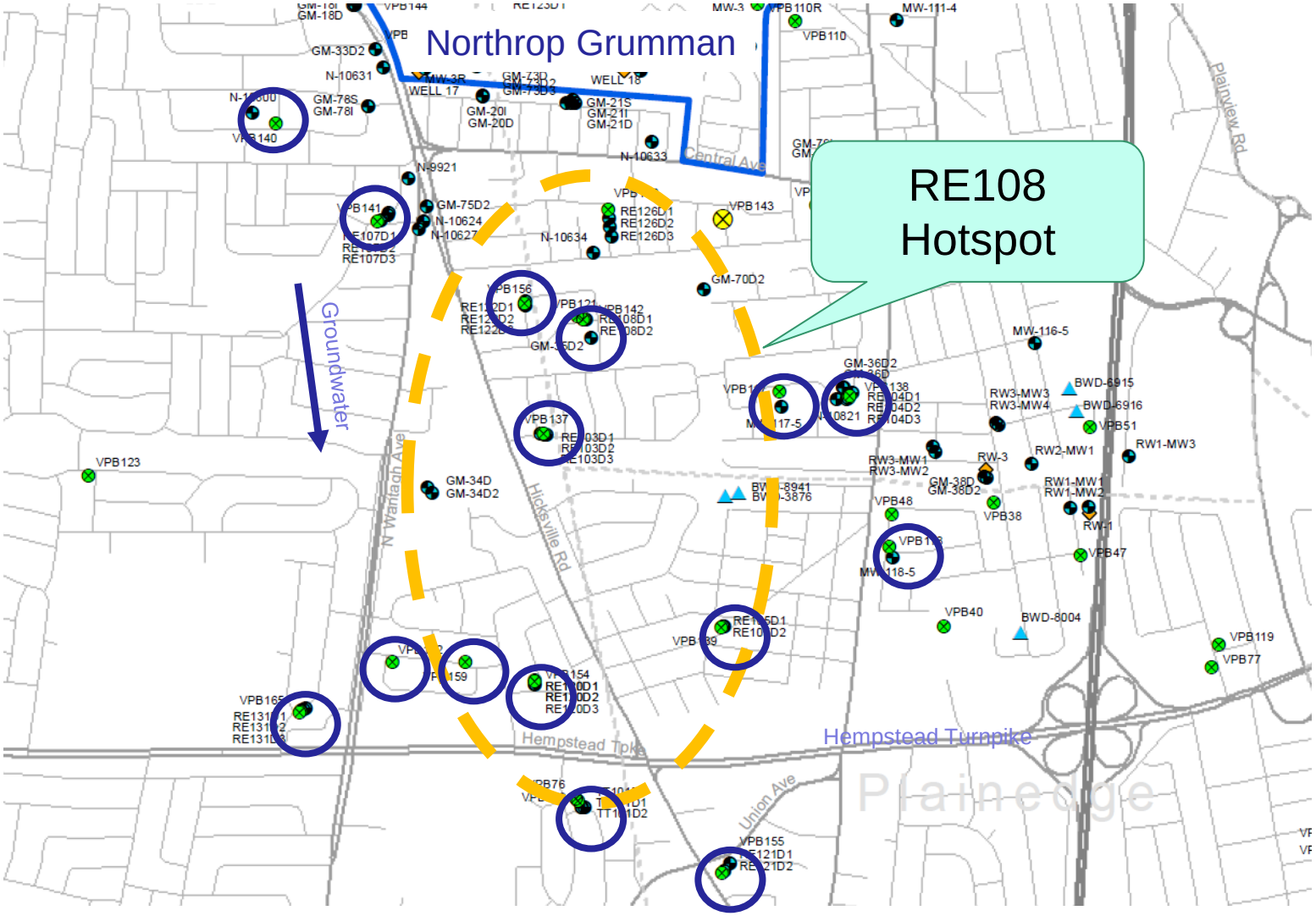
- RE108 Hotspot Area
  - Formerly known as the Bethpage Water District (BWD) Plant 6 Hotspot
  - First confirmed in 2011 based on Trichloroethene (TCE) at greater than 1,000 micrograms per liter (ug/L) in BWD Well 6-2
  - Vertical profile boring and monitoring well data has been sufficiently defined to proceed, plume delineation subject to ongoing investigations



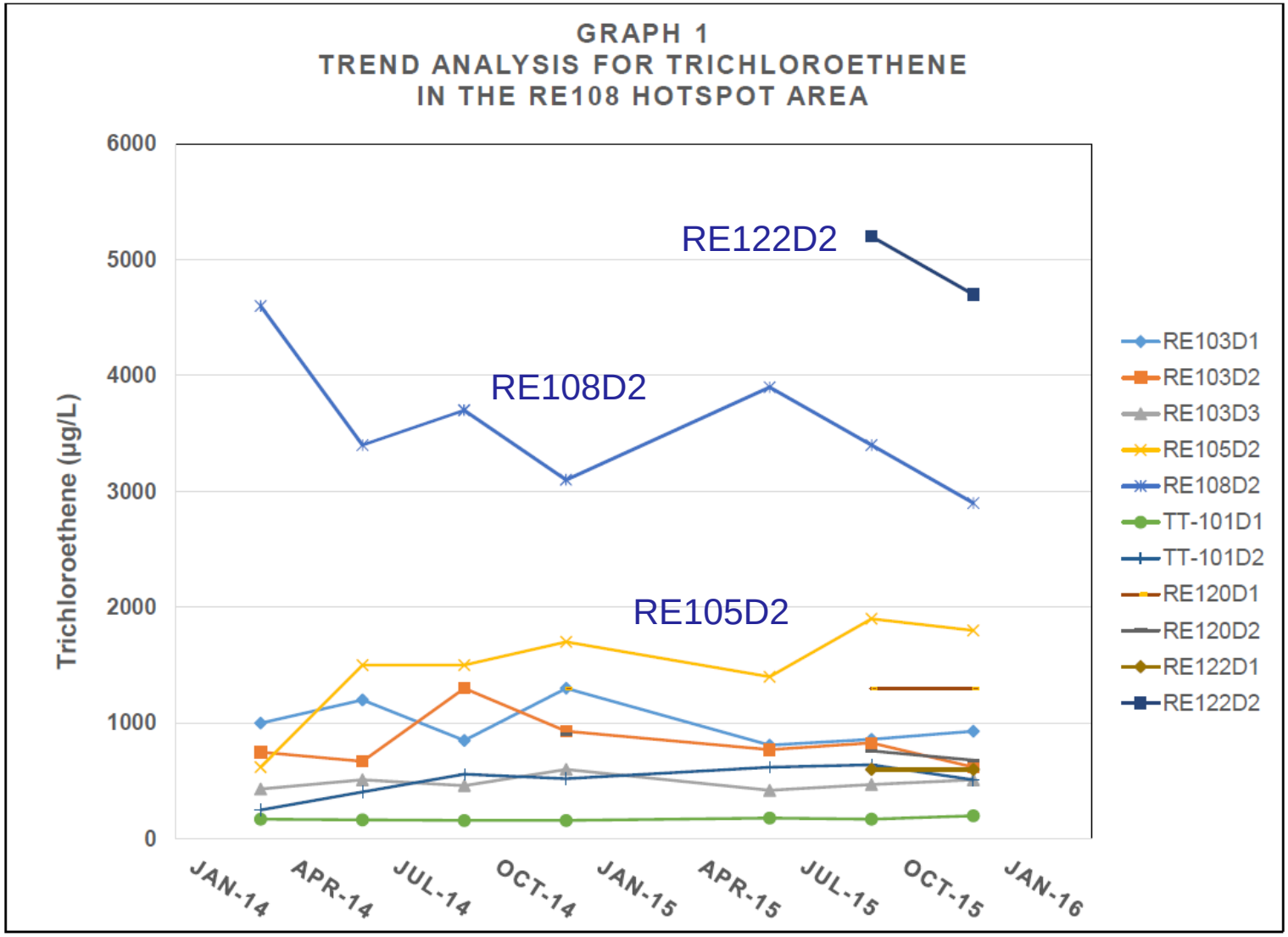
Conceptual Site Model – RE108 Hot Spot Area



RE108 Hotspot Area – Plume Delineation Using Vertical Profile Borings



RE108 Hotspot Area Investigation



RE108 Hotspot Area

Design

- Two to four extraction wells, 500 to 700 feet below ground surface
- Combined pumping rate of 900 to 1,200 gallons per minute
- Treatment Process: Air Stripping and Granular Activated Carbon
- Also considering Chemical Oxidation
- Treatment Goal: Drinking Water Standards

RE108 Hotspot Area

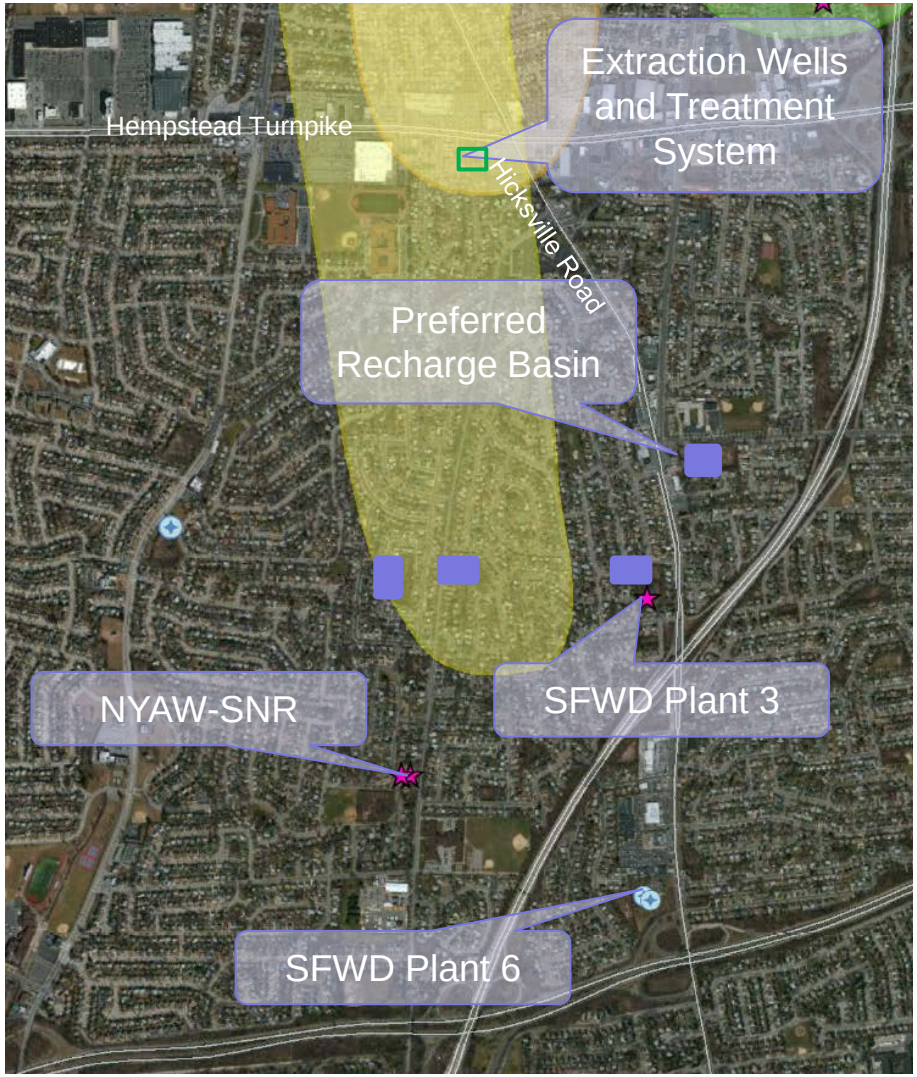
Design

- Treatment Plant Dimensions: 75 feet by 75 feet by 25 feet high
- Treatment Plant property buffer, minimum of 100 feet to occupied structures – 2 acres
- Additional land for extraction wells and piping
- Preferred initial location is near the intersection of Hicksville Road and Hempstead Turnpike (TP Opt1)
- Alternative Treatment Plant Locations include Wantagh Avenue (TP Opt2) and Stewart Avenue (TP Opt3)

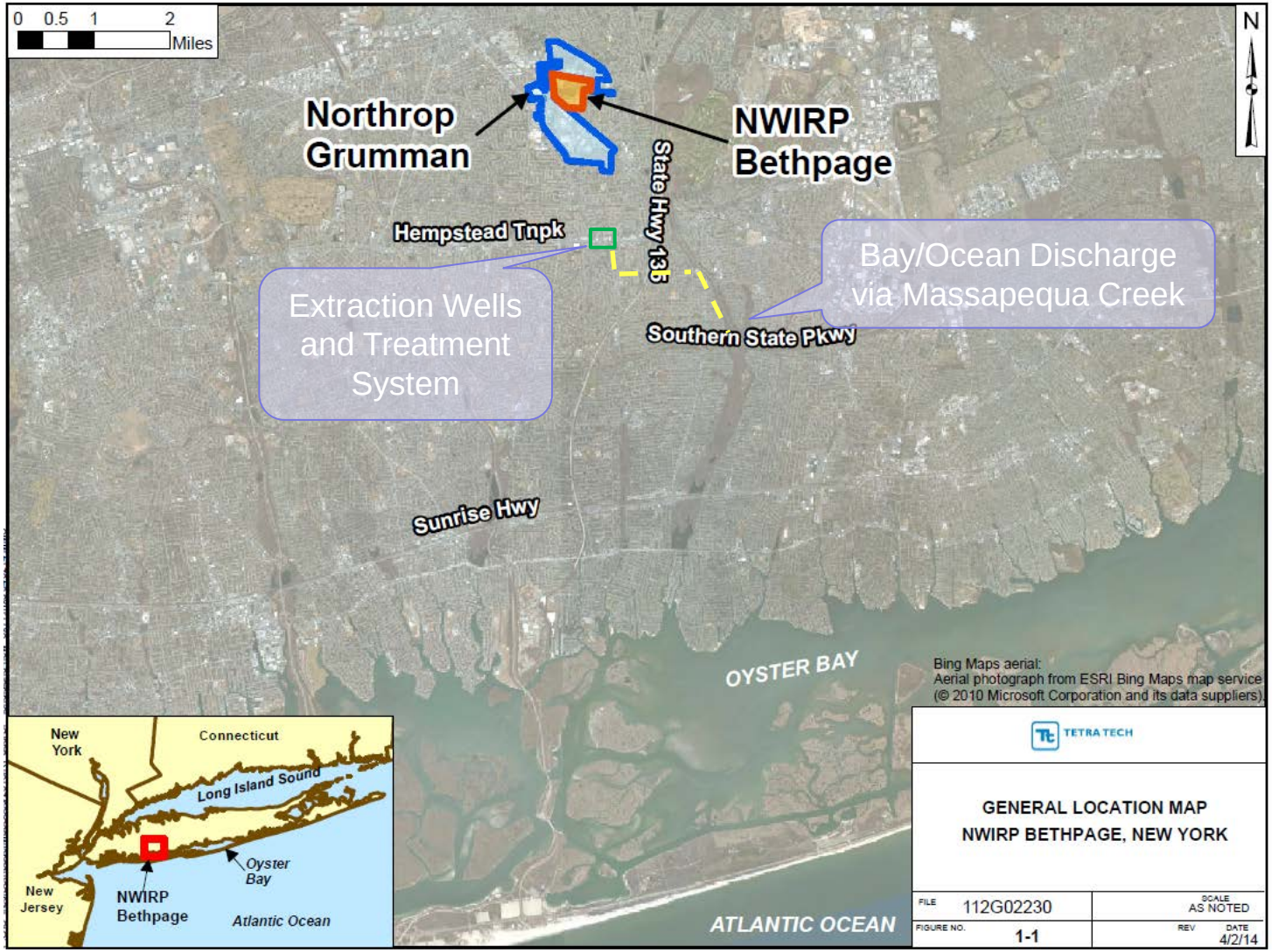
RE108 Hotspot Area

Design (Continued)

- Discharge to Recharge Basin, Hicksville Road – 3,500 feet southeast
- Concern with pushing plumes to other water districts:
  - Levittown Water District (LWD)
  - New York American Water (NYAW)
  - South Farmingdale Water District (SFWD)
- Other discharge options for treated water include:
  - Basins near TP Opt2 and Opt3 (previous slide)
  - Northrop Grumman/Naval Weapons Industrial Reserve Plant properties
  - Injection Wells various locations
  - Sanitary System (Cedar Creek)
  - South Oyster Bay



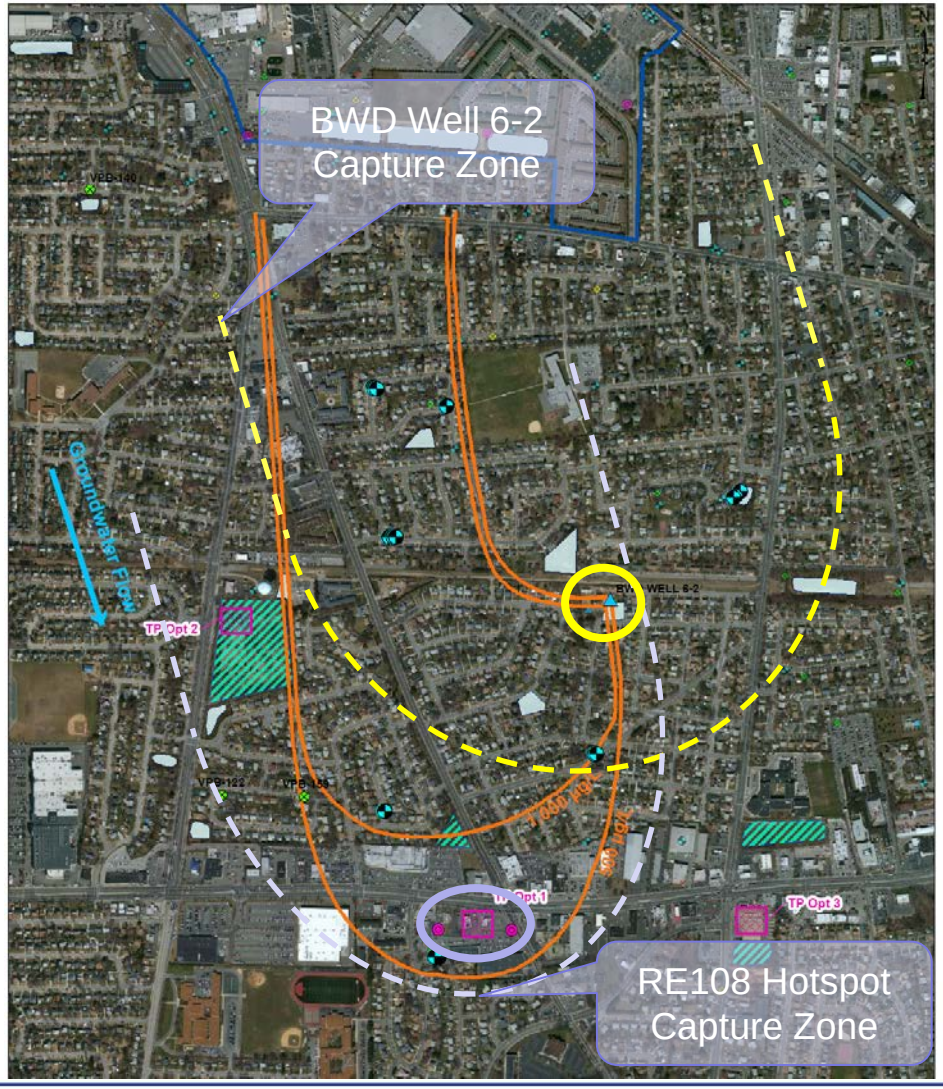
RE108 Hotspot Area



RE108 Hotspot Area Capture Zone

RE108 Hotspot Area Capture Zone

- Currently estimated capture zones for BWD Well 6-2 and RE108 Hotspot Wells
- Capture zones are based on 24-hour pumping test, evaluation indicates that BWD Well 6-2 sustained operation may miss a portion of the hot spot
- Navy is conducting a three-month pumping test using BWD Well 6-2 to better establish capture zone



RE108 Hotspot Area Path Forward

Path Forward

- Preliminary Design Activities Underway, Basis of Design Report – 2017
- Property Access – 2018 and 2019
- Design Activities – 2019 and 2020
- Construction/Startup – 2021 and 2022